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## Maine's Sea Urchin Fishery

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Sea urchin broken open.

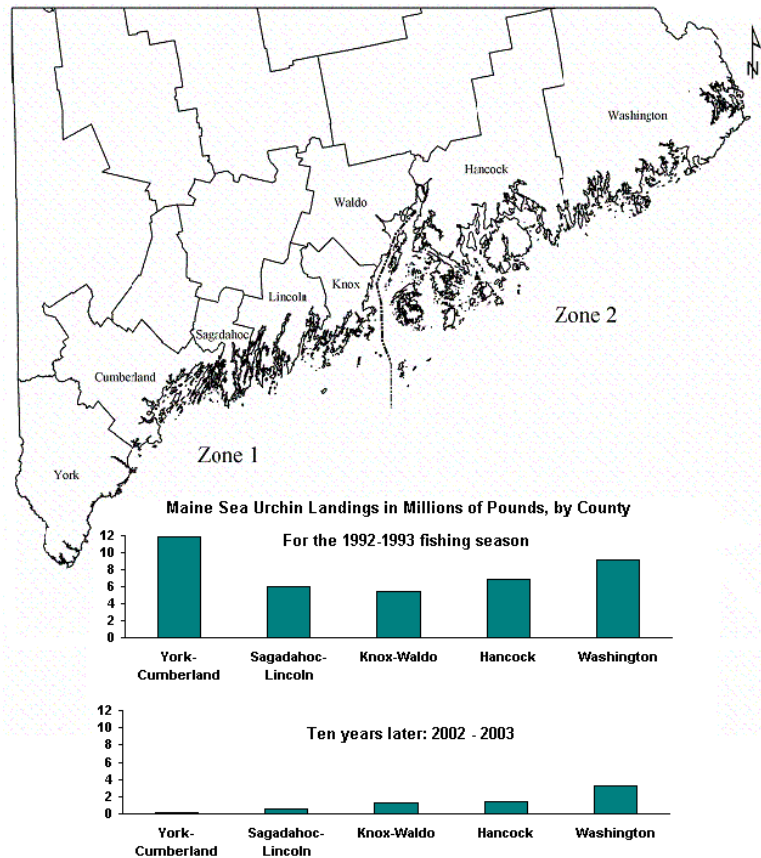
Photo by Kerry Lyons

**History** - A small fishery for green sea urchins has existed in Maine since prehistoric times. The sea urchin's yellow "roe", organs that are both reproductive and energy storing, are highly edible and can grow to 10-25% of the animal's weight during the winter months. However, the market demand for sea urchin roe used to be small, and a huge population, virtually unfished, built up in Maine's shallow coastal waters during the 1970s and 1980s. The spiny urchins became a serious pest, eating and destroying kelp beds and clogging and damaging lobster traps. Scientists described them as a marine "weed", pervasive and indestructible.

**The Rise** - In 1987, a market for Maine sea urchin roe developed in Japan, and a valuable fishery rapidly developed. By 1994 there were 2,725 licensed Maine sea urchin divers and draggers, who harvested 38 million pounds of urchins valued at \$33 million that year. Concern that the urchin resource was starting to show signs of overfishing prompted management actions by the Maine legislature and the Department of Marine Resources (DMR) to restrict the fishery beginning in 1995. The Maine Sea Urchin Zone Council (SUZC), comprised of harvesters, dealers, and independent scientists, was established to advise the managers.

**The Fall** - Since then, despite a limit on the number of harvesting licenses, a reduced season (94 fishing days annually), the establishment of two exclusive fishing zones, and minimum and maximum legal size limits, the urchin population has continued to decline, mainly because of fishing. Scientists estimate that the biomass of urchins in Maine coastal waters has fallen from 61,000 tons in 1987 to 11,000 tons in 2004.

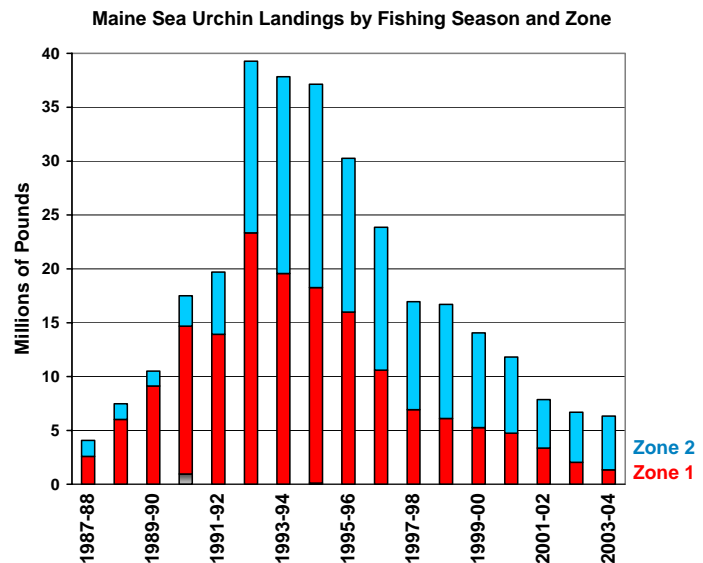
In the early to mid 1990s, sea urchins became scarce along Maine's southern coast, as the most accessible beds from Kittery to Casco Bay were fished out. The decline then spread eastward, to the Boothbay, Rockland, and Stonington areas, evident from landings records and dockside interviews with harvesters.



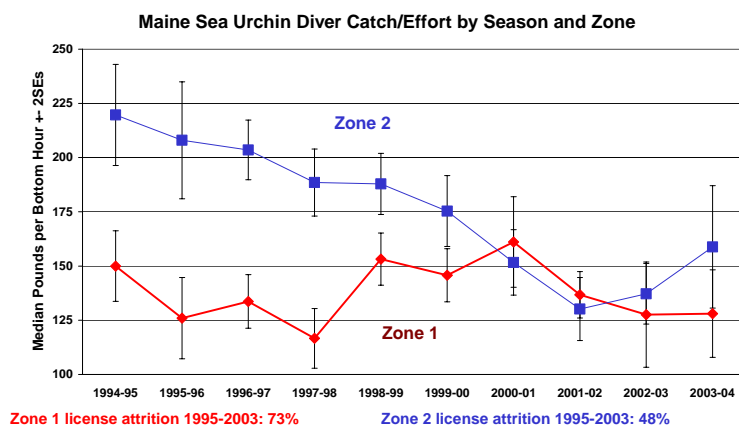
Understanding the causes for this decline has been complicated by an urchin die-off in the midcoast area during 1999-2001, possibly due to a parasitic infection triggered by unusually warm water temperatures. The extent and severity of the die-off is unknown, but it certainly did not help matters. A recent boom in populations of crabs, which eat sea urchins, has also hindered urchin recovery.

By 2003 the number of licensed sea urchin harvesters in Maine had dropped to 742. Approximately 80 divers and 1 dragger in Zone 1 (Kittery to Rockland) fished at least 10 times during the 2002-03 season, and 130 divers and 80 draggers in Zone 2 (Vinalhaven to Eastport), for a total of about 290 active harvesters, not counting their crews. There were also 11 licensed sea urchin buyers and 13 processors in the state.

The annual landings of sea urchins have declined to about 6.3 million pounds valued at \$8.8 million for the 2003-04 fishing season. Of these, 1.3 million pounds were landed in Zone 1, and 5.0 million pounds were landed in Zone 2. Although landings can be influenced by many factors, and are not necessarily the best indicator of the size of a stock, there is other evidence that the decline in the Maine's urchin stock is real and has not been halted.



**Taking Stock** - In 1994, the DMR began a fishery-monitoring program, which is paid for by a surcharge on industry licenses. Urchin harvesters are interviewed on the docks as they land the day's catch and samples are collected. Harvesters are asked about the quantity caught, location of fishing, and the amount of fishing effort expended. The quantity of catch made in one hour of fishing time is called "catch per unit effort", or CPUE. If urchins are plentiful, harvesters should be able to catch more of them in an hour of fishing than they can if urchins are scarce. Fisheries managers often use CPUE as an indicator of stock abundance. CPUE for urchin management



Zone 2 dropped steadily for 7 years, then stabilized. CPUE for Zone 1 however, has been less informative. No one would deny that the resource in Zone 1 is in worse shape now than it was in 1995, or that the resource in Zone 1 is less healthy than in Zone 2. However, current Zone 1 CPUE has not dropped significantly below 1995 levels. Apparently CPUE for Zone 1 had declined and "bottomed out" by the time the monitoring program began. Divers who cannot achieve,

say, between 125 and 150 pounds per hour have dropped out of the fishery. This is supported by

The best, most direct (and most difficult and expensive) way to evaluate the status of the sea urchin stock is to get in the water and count urchins. In 2001, DMR, with the cooperation of industry, the SUZC, and scientists and students at the University of Maine, began an annual spring sea urchin dive survey, funded by the industry. DMR and industry divers counted and measured urchins at 135 shallow sites, working from industry vessels. A remotely deployed video camera was used to view the bottom at 90 deeper sites. Crabs, starfish, and algal (seaweed) cover were evaluated. The survey has been repeated each year since 2001. Preliminary results from the survey are presented in the table below. They show declines in the urchin stock in 7 out of 9 regions since 2001.

July 26, 2004

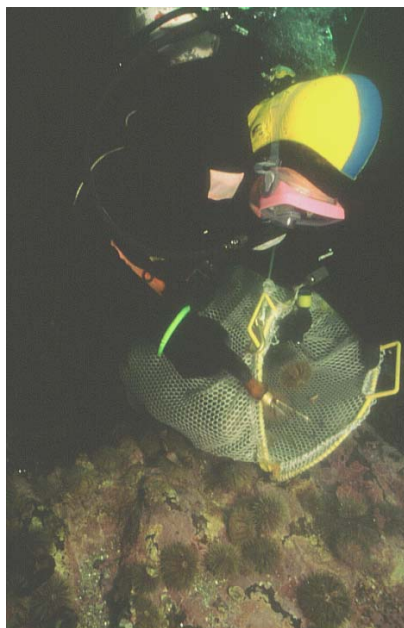


Photo by Heather Perry

**The Problem** - Studies by scientists at the University of Maine and the Bigelow Laboratory, funded by the industry, have shown the importance of maintaining a minimum density of urchins, in order to ensure their reproductive success and to prevent further loss of suitable sea urchin habitat. Many of the ledges that used to be carpeted with urchins are now covered with kelp and other seaweeds that have been able to thrive now that sea urchins are no longer there to eat them. These seaweed beds are home for crabs and other animals that eat small urchins. This means that once the urchin bed is gone it is very difficult for urchins to reestablish themselves in an environment that has become inhospitable. There are now areas in southwestern Maine that have been devoid of urchins for the past 8 to 10 years that have not recovered even though there has been no recent fishing there. (It takes about 4-8 years for a sea urchin to grow to marketable size.) This loss of urchin habitat is creeping eastward, and is no longer just a Zone 1 problem.

To maintain healthy urchin beds it is important that some urchins be left undisturbed, in dense enough aggregations so that they can reproduce successfully and preserve an environment that protects young urchins. So far, the state's minimum legal size limit and other restrictions have not been enough to protect the necessary density of urchins. The numbers that are shaded in the previous table are urchin densities that may be too low to maintain healthy urchin beds.

**The Solution** - For insight into appropriate management strategies for Maine's sea urchin fishery, it is useful to examine the experiences of other urchin fisheries worldwide. A recent report on the world's urchin fisheries concluded that in general, sea urchin fisheries have had a poor record of sustainability, appropriate stock assessments are lacking, and management has been ineffective. Exceptions include a few jurisdictions that have conducted



Sea urchin divers unloading their catches in Winter Harbor, April 1997.

Photo by Ted Creaser

stock assessments, have sustainable or developing urchin fisheries, and have developed a precautionary approach to management. These include the green sea urchin fisheries in British Columbia, Alaska, and New Brunswick, where estimates of the current biomass are made, and the fisheries are allowed to take a small percentage (also called exploitation rate) each year. These rates vary from 2% to 10%. Last year Maine's exploitation rate was far higher – at about 25%. In the short term, drastic reductions in fishing effort are necessary to reduce this rate. In the long term, local management (on a smaller spatial scale) may provide the best opportunity to manage sea urchins in a way that addresses their ecological role and maximizes roe production.